AMENDMENTS TO THE TITLE

Please amend the title, as follows:

–SYSTEM AND METHOD FOR RAPIDLY ~~TACKING~~ TRACKING MULTIPLE FACES–.

AMENDMENTS TO SPECIFICATION

Page 1, lines 5-7:

The present invention relates to the field of video signal processing, and, more particularly, to a system and method for rapidly ~~tacking~~ tracking multiple faces.

Page 2, line 22 to Page 3, line 6:

Besides, for all above approaches, the most challenging problem is to track multiple-persons in real-time. In this problem, the tracked persons will appear or disappear in the video sequence in any time. For a desired system, it should have enough capabilities to identify and deal with the conditions when the tracked person disappears or one new person is coming. Therefore, the required hardware is very complex and the amount of data to be processed is very large, and thus, it is unsuitable in many applications. Accordingly, it is desirable to provide an improved system and a method for rapidly ~~tacking~~ tracking multiple faces to mitigate and/or obviate the aforementioned problems.

Page 3, lines 8-10:

The object of the present invention is to provide a system and method for rapidly ~~tacking~~ tracking multiple faces, which is able to effectively detect and track a plurality of faces in real-time.

Page 3, line 11 to Page 4, line 7:

In accordance with one aspect of the present invention, there is provided a system for rapidly ~~tacking~~ tracking multiple faces, which includes a face-like region generator having a skin region extractor and a motion analyzer. The skin region extractor generates a plurality of skin regions by detecting skin color pixels of an input image. The motion analyzer determines possible face-like regions from the skin regions based on moving information of the input image. Moreover, a face recorder is provided for recording tracked faces. A face status checker is provided for checking the face-like regions and the faces previously tracked and recorded in the

face recorder to determine whether the face-like regions are old faces which have been tracked in a previous frame or are possible new faces. A face verification engine is provided for determining whether the possible new faces are true new faces. A face tracking engine is provided for tracking multiple faces based on the new and old faces, and the skin regions provided by the skin region extractor. When a tracked face is a new face, the face tracking engine directly adds the new face to the face recorder. When a tracked face is an old face, the face tracking engine determines whether there exists more than a predefined percentage of overlapping area between the old face and a skin region, and if yes, it is determined that the old face is still in the current frame and its position is located in the center of the skin region; otherwise, the position of the old face is determined by a correlation operation.

Page 4, lines 8-19:

In accordance with another aspect of the present invention, there is provided a system for rapidly ~~tacking~~ tracking multiple faces, which includes a face-like region generator having a skin region extractor, a motion analyzer and a silhouette analyzer. The skin region extractor generates a plurality of skin regions by detecting skin color pixels of an input image. The motion analyzer determines possible face-like regions from the skin regions based on moving information of the input image. The silhouette analyzer analyzes whether there exists a ~~protrusion~~ raised shape in the image so as to separate connected regions. Moreover, a face verification engine is provided for determining whether the possible faces are new faces. A face tracking engine is provided for tracking multiple faces based on the faces and the skin regions provided by the skin region extractor.

Page 4, line 20 to Page 5, line 9:

In accordance with still another aspect of the present invention, there is provided a method for rapidly ~~tacking~~ tracking multiple faces. The method comprises the steps of: (A) detecting skin color pixels of an input image for generating a plurality of skin regions; (B) determining possible face-like regions in the skin regions based on moving information of the input image; (C) checking the face-like regions and tracked faces previously stored to determine

whether the face-like regions are old faces that have been tracked in a previous frame or are possible new faces, wherein, if the face-like regions are old faces, it is further determined whether there exists more than a predefined percentage of overlapping area between an old face and a skin region, and if yes, the old face ~~are~~ is still in the current frame and its position is located in the center of the skin region, otherwise, the position of the old face is determined by correlation operation; and (D) determining whether the possible new face is a true new face, and if yes, recording the new face.

Page 5, lines 14-15:

FIG. 1 shows the structure of the system for rapidly ~~tacking~~ tracking multiple faces according to the present invention.

Page 5, lines 19-25:

FIG. 1 shows a preferred embodiment of the system for rapidly ~~tacking~~ tracking multiple faces in accordance with the present invention. As shown, a captured image 10 is processed by a face-like region generator 11. The face-like region generator includes a skin region extractor 111, a motion analyzer 112, a silhouette analyzer 113 for determining possible face-like regions in an input image based on skin color, movement, and silhouette information.

Page 7, line 15 to Page 8, line 10:

However, in some cases, face regions cannot be well identified by using only color and moving information. For example, different faces will connect together due to skin-color clothes or naked body. Therefore, the connected faces have to be separated by the silhouette analyzer 113. Basically, the contour of a face-like region looks like a ~~protrusion~~ raised shape having a height larger than its width (similar to the symbol "Π"). That is, the face-like region has two sharp down-edges in its right and left sides. Therefore, by analyzing the contour of a face to find the ~~protrusion~~ raised shape in the image 10, it is able to separate the faces. That is, let v(x) denote the vertical position of the first touched pixel of the connected region R when tracking

all pixels of an image along the x-th column from top to down. Then, the position difference d(x) can be obtained as follows:

$$d(x)=v(x-1)-V(x+1).$$

If the absolute value of d(x) is larger than a threshold, there exists a vertical edge E_i. Let e(i) denote the edge response of E_i, i.e., e(i)=d(p(i)) where p(i) is the position of ~~Ei~~ E_i. If there is a face-like region between two neighbor sharp edges E_i and E_j, the following rules should be satisfied:

$$e(i)>w \text{ and } e(j)<-w, \text{ where } w=0.5*(p(j)-p(i)).$$

Accordingly, the connected faces can be separated by analyzing whether a ~~protrusion~~ raised shape ~~is existed~~ exists in the image.

Page 11, lines 23-25:

In view of the foregoing, it is appreciated that the system and method for rapidly ~~tacking~~ tracking multiple faces in accordance with the present invention has the following advantages: